



## King's Research Portal

DOI:

[10.1007/s11138-016-0353-0](https://doi.org/10.1007/s11138-016-0353-0)

*Document Version*

Peer reviewed version

[Link to publication record in King's Research Portal](#)

*Citation for published version (APA):*

Lewis, P., & Wagner, R. E. (2017). New Austrian Macro Theory: A Call for Inquiry. *Review of Austrian Economics*, 30(1), 1-18. <https://doi.org/10.1007/s11138-016-0353-0>

### **Citing this paper**

Please note that where the full-text provided on King's Research Portal is the Author Accepted Manuscript or Post-Print version this may differ from the final Published version. If citing, it is advised that you check and use the publisher's definitive version for pagination, volume/issue, and date of publication details. And where the final published version is provided on the Research Portal, if citing you are again advised to check the publisher's website for any subsequent corrections.

### **General rights**

Copyright and moral rights for the publications made accessible in the Research Portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognize and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the Research Portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the Research Portal

### **Take down policy**

If you believe that this document breaches copyright please contact [librarypure@kcl.ac.uk](mailto:librarypure@kcl.ac.uk) providing details, and we will remove access to the work immediately and investigate your claim.

## **New Austrian Macro Theory: A Call for Inquiry**

Paul Lewis  
Department of Political Economy  
Kings College London  
<http://papers/ssrn.com/author=763360>

Richard E. Wagner  
Department of Economics  
Hayek Program on Politics, Philosophy, and Economics  
George Mason University  
<http://papers/ssrn.com/author=238919>

**Forthcoming in the *Review of Austrian Economics***

### **Abstract**

This essay sketches some contours of what we think can reasonably be called New Austrian macro theory. By New Austrian, macro we mean a style of theorizing that incorporates the core of traditional or Old Austrian macro and pushes that core in new directions by using new analytical tools and methods. We would note that New Austrian is not some invention or construction *de novo*, but is a product of blending some traditional Austrian insights and formulations with new analytical formulations that were never part of the Austrian tradition but which can multiply the analytical oomph of that tradition. In this essay, we explain that the traditional Austrian macro theory suffers not from analytical wrong-headedness but from an underdevelopment of those complementary pieces of intellectual capital that would render Austrian macro once again a significant player in the efforts of economists to theorize about the properties of economic systems in their entirety.

**Keywords:** structure of production; dispersed knowledge; equilibrium vs. non-equilibrium theory; creative systems theory; macro-foundations for micro

**JEL Codes:** B53, D80, E02, E14, E42

## **New Austrian Macro Theory: A Call for Inquiry**

This essay sketches some contours of what we think can reasonably be called New Austrian macro theory. By New Austrian macro we mean a style of theorizing that incorporates the core of traditional or Old Austrian macro and pushes that core in new directions by using new analytical tools and methods. We would note that New Austrian is not some invention or construction *de novo*, but is a product of blending some traditional Austrian insights and formulations with new analytical formulations that were never part of the Austrian tradition but which can multiply the analytical oomph of that tradition. In this essay, we explain that the traditional Austrian macro theory suffers not from analytical wrong-headedness but from an underdevelopment of those complementary pieces of intellectual capital that would render Austrian macro once again a significant player in the efforts of economists to theorize about the properties of economic systems in their entirety.

This introductory essay is followed by five papers from young scholars who are well versed in the traditional Austrian approach to macro theory, as well as being filled with ideas about how to proceed along different theoretical lines that would extend the traditional Austrian insights in sufficiently new directions to qualify as New Austrian macro theory. Originally, these papers were presented at the November 2015 meetings of the Society for Development of Austrian Economics, and have since undergone revision in response to editorial suggestions and criticisms. The authors are either current or past students at George Mason University, and with one of those students having as a co-author a current faculty member at George Mason University. These

papers tackle problems and offer insights that come into the analytical foreground within the New Austrian vision for macro or systems theorizing.

In “Toward a New Austrian Macroeconomics,” Vipin P. Veetil and Lawrence H. White present a wide-ranging comparison of points of similarity and difference between their vision of a New Austrian macroeconomics and standard macro framework grounded in the DSGE (Dynamic Stochastic General Equilibrium) model of a macroeconomy. In “Playing at Markets: A New Austrian Perspective on Macroeconomic Policy,” Alexander William Salter explains how orthodox expositions of macro policy create a form of shell game in deflecting the attention of observers away from the micro-level interactions out of which macro variables emerge. In “Dynamic Coordinating Non-Equilibrium,” Santiago Gangotena sets forth an alternative to the DSGE model wherein generally coordinated patterns of economic activity arise within a generative or non-equilibrium scheme of modeling. In “The Unresolved Problem of Gratuitous Credit in Austrian Banking Theory,” Raymond Niles probes some points of controversy in Austrian banking theory over whether elasticity in the supply of money is a modest or a severe source of economic discoordination, or whether it might actually have socially beneficial properties in facilitating experimentation. In “Entrepreneurship, Search Costs, and a Realist Construct of Rationality in an Agent-based Economy,” James Caton explores different approaches to rationality in individual action in a manner that is congruent with continual experimentation and the injection of novelty into non-equilibrium but generally coordinated processes.

Standard Austrian macro theory is exemplified by Mises (1912) and Hayek (1932, 1935), and is presented systematically by Horwitz (2000) and Garrison (2001).

This theory starts from systemic or general equilibrium within a Walrasian scheme of thought, and asks how to explain observed departures from systemic equilibrium. With systemic equilibrium being presumed to be the normal state of affairs, the analytical challenge is to give an economically intelligible account of the booms and busts that are recurring features of the historical record. Standard Austrian macro has some valuable features that can still be incorporated valuably into the rest of economic theory, but it also has some features that prevent such incorporation, and which at the same time run contrary to the deepest of Austrian intuitions about economic theory. We start this introductory essay by identifying what we regard as the best quality of standard Austrian macro theory, after which we identify what we regard as the worst quality. After we identify what we regard as the best and the worst elements of traditional Austrian macro theory, we devote the rest of this essay to elaborating some particular schemes of thought that derive from our identification of the best and the worst, and which thereby point toward a New Austrian macro that offers the potential for once again becoming a significant player in scholarly examinations regarding the properties of economic systems in their entirety.

### **The Best of the Austrian Macro Tradition: Structure of Production**

In our judgment, the best element in the Austrian tradition of macro theorizing is its emphasis on the structure of production, in contrast to the customary use of a circular flow of economic activity. Within the circular flow conception of the economic process, everything is instantaneous and time is of no consequence. Inputs are applied and outputs derived, without the passing of time as being significant in any but a

notional sense. In sharp contrast, traditional Austrian theory insists upon a structure of production where some activities are directly involved in producing consumer goods while other activities are involved in producing capital goods that will facilitate the production of consumer goods in years to come. A key question in traditional Austrian theory is what determines the time-length of this structure of production. The answer is that it depends on the willingness of people to postpone current consumption relative to the gain in future consumption that people anticipate will result from that postponement.

A structure of production view of the economic process yields several insights that unavoidably are hidden from a circular flow view. One is an appreciation of the significance of the interest rate as exerting an influence throughout the entire social structure of production. The interest rate is not merely the price of money, the price of loans, or of any other singular item or market. It is rather something that shapes the entire pattern of production within a society, and it speaks to how it is that the orientation of people within a society toward present and future is of great economic significance. This significance comes readily into the foreground in the traditional Austrian framework, but it comes close to vanishing within the circular flow notion of economic activity.

Traditional Austrian macro started with conceptualizing an economic system as a structure of production and not a circular flow. A central feature of this conceptualization is that the activities of some enterprises are closer in time to the creation of consumer goods than are the activities of other enterprises. To be sure, this conceptualization reflects an objectification of the economic process. From the point of view of participants within the process, they operate inside a flow of activity where inputs enter a firm and

outputs exit a firm. Market transactions are everywhere, regardless of how they might be placed within a structure of production. Yet recognition that there is a temporal pattern to the structure of production is the most valuable distinguishing feature of traditional Austrian theory of the system of economic interaction as a whole. It is a very short step from a structure of production to Hayek's (1937, 1945) recognition that the knowledge that accompanies and propels economic interaction is never assembled in one mind or place but rather is distributed throughout the universe of economic activity.

### **The Worst of the Austrian Tradition: Societal Equilibrium**

Traditional Austrian macro, as conveyed by its theory of business cycles, sterilizes the central insight that a structure of production offers. This sterilization is illustrated cogently in Joseph Schumpeter's (1912) *Theory of Economic Development*. There, Schumpeter offers a circular flow as a reduction from a structure of production under the presumption of systemic equilibrium. He illustrates this with a forest where saplings are planted in one year and mature trees harvested 40 years later. Assuming that the forest is part of a system in equilibrium, it is simpler to work with a circular flow where an input of saplings, capital, and labor yields mature trees.

To work with systemic equilibrium, even as just a point of analytical departure, is to eviscerate the central contributions of Austrian macro theory. With a circular flow, it appears sensible to posit an aggregate production function, as in macro growth theory, and use that theory to render statements about economic growth. Such statements would be nonsensical from within a structure of production, because from within this framework it would be necessary analytically to incorporate particular activities at

particular places within the structure of production. Doing this, however, cannot be undertaken at the macro level, for these are micro-level activities. It is meaningless to speak of increasing the supply of human capital or increasing the stock of knowledge. It is particular types of knowledge acquired by particular people within a particular structure of production that matters, and which can in no way be illuminated by working with circular flows. Yet a theorist who works with systemic equilibrium will find it needlessly complicated to insist on working with a structure of production.

To carry forward an analytical scheme based on a structure of production requires recognition that a non-equilibrium mode of analysis is the complementary piece of intellectual capital that is necessary to bring the structure of production to life, while also bringing life to Hayek's ideas about divided and distributed knowledge. We should note, however, that to speak of a non-equilibrium mode of analysis is not to embrace disequilibrium theorizing. Disequilibrium theory is simply a negation of equilibrium theory, and a New Austrian theory would have no use for either. Hayek's (1937, 1945) treatments of inherently incomplete knowledge are intellectual misfits within a framework of economic equilibrium.

### **The Mixed-Metaphor Quality of Traditional Austrian Macro Theory**

The traditional Austrian theory of the economy as an entirety has a mixed-metaphor quality. At the micro level it places strong emphasis on divided and incomplete knowledge, and how economic interaction promotes the acquisition and use of knowledge. No single individual can describe all of the steps people must take at various dates to produce a pencil now, for doing that lies beyond human capacity. Yet



economic interaction within a societal framework governed by private property and freedom of contract enables the production of pencils, as well as all of the other things we take for granted, all of which are emergent products of human interaction and not direct products of some particular agent's intelligence and foresight. By positing equilibrium at the societal level, the significance of a structure of production is lost, as is recognition that its operating features are emergent qualities of social interaction. While the structure of production occupies the analytical foreground in generating what is generally described as Austrian capital theory and Austrian cycle theory, conveying those ideas by embracing a Walrasian point of departure neuters the contributions that an emphasis on a structure of production could enable. Hence, the presumption of systemic equilibrium is what we regard as the worst quality of traditional Austrian macro theory.<sup>1</sup>

The marriage of a structure of production to a presumption of systemic equilibrium renders incoherent the work that a structure of production potentially can do. The familiar Hayekian triangle can illustrate the problem created by this mixed metaphor quality. Trees are planted in one year and harvested 20 years later. There is a structure of production through which saplings become harvested 20 years later and converted to lumber to be used in various wood-using activities and products. The passing of time is an integral feature of the production process.

How long trees will be left to grow before they are harvested depends on the relationship between the value of the added wood that the owners of that wood

---

<sup>1</sup> For a useful account of the impediments caused by Schumpeter's attempts to do justice to his underlying vision of the economic process by his reliance on the notion of equilibrium, see Graça Moura ([2002] 2015, 2014). On the significance of Hayek's escape from the notion of equilibrium to the broader concept of social order, see Fleetwood ([1996] 2015).

anticipate will result from another year of growth and the willingness of those owners to forego the consumption that harvesting the trees would enable. The boom and bust character of traditional Austrian theorizing arises at this point in recognition of how banking systems can generate variability in the supply of money and credit without any change in the willingness of people to refrain from consumption.

The analytical point of departure for traditional Austrian macro is a structure of production that is consistent with the Walrasian notion of general equilibrium, only with a banking system added. Within the Walrasian scheme, relationships among entities operating at different points in the structure of production would be governed by the natural rate of interest. This rate of interest is not directly observable, but rather is a theoretical construction that creates a situation where no economic entity acts so as to shorten or lengthen the structure of production. When a banking system is introduced, a market rate of interest arises where the rate of interest equilibrates the supply of saving that individuals leave with banks and the demand for loans that other individuals present to banks. The problem of gratuitous credit, the topic of Raymond Niles's paper for this symposium, arises at this point.

Suppose a banking system, perhaps enabled by a central bank, were to expand the supply of loans beyond what would have maintained the natural rate of interest. This expansion will depress the market rate of interest below the natural rate. In consequence, the demand for loans will expand. That expansion, moreover, will have a particular temporal structure that favors long-lived over short-lived projects. To illustrate, suppose borrowed money can be invested either in a project that matures in one year or in one that matures in two years. Suppose the rate of interest prior to credit expansion is

ten percent. Where the one-year project would have to be evaluated as worth at least \$110 to appear worthwhile, the two-year project would have to be evaluated as worth at least \$121, or ten percent more than the one-year project.

Suppose bank credit expansion reduces the market rate of interest to five percent. The one-year project would now appear valuable so long as it was projected to return at least \$105. The credit expansion will thus increase the absolute desire to expand one-year projects. The two-year project, however, will now appear profitable so long as it was projected to return at least \$110.25. While the credit expansion also increases the profitability of two-year projects, it also increases the profitability of the longer project relative to that of the shorter project. Initially, two-year projects would be chosen only to the extent their return was thought to be at least ten percent higher than what one-year projects were thought to offer. After the credit expansion, however, two-year projects would be chosen so long as they appeared to be but five percent more profitable than one-year projects. In consequence, the structure of production would lengthen through an expansion in relatively capital intensive activities.

The most significant consequence of this boom set in motion by monetary expansion is a subsequent collapse that is set in motion by the lengthening in the structure of production. This boom is fueled by credit expansion by the banking system, as against being fueled by an increase in the supply of saving that would have reflected a change in consumer preferences. The production of capital goods expands relative to consumer goods. In the forestry illustration above, trees would be allowed to grow beyond 20 years, which would require a reduction in the volume of trees converted into lumber. But consumer demand for lumber products has not fallen. Indeed, it has

probably increased in consequence of the higher aggregate income the boom generates. This situation creates an inconsistency between the lengthening of the structure of production that credit expansion has set in motion and the unchanged or even increased demand for consumer goods within the society. The initial expansion will be reversed until the original structure of production is restored: an initial boom will be transformed into a bust until restoration is achieved.

To give some substantive illustration for an abstract discussion, the initial boom that increases the apparent profitability of longer-lived projects might take the form of increased investment in saws and other machinery for harvesting trees. Lathes and other equipment will be built to provide implements for building that machinery. People will be trained and employed to operate that equipment and machinery. At some point, however, the owners of enterprises will realize that their plans are not working out as they had hoped, and will seek to liquidate what have proved to be bad commercial choices.

The bust was rendered necessary because of the boom that was generated by an increase in the volume of credit that was not supported by an increase in the desire of people to save more and consume less. Robert Lucas (1975) developed a similar model of a business cycle based on a signal extraction problem where people could not distinguish accurately between general or average price changes and changes in particular prices. This formulation bore a strong family resemblance to Old Austrian macro. Soon thereafter, however, Lucas abandoned that formulation upon recognizing that aggregate monetary data are readily available, which rendered problematic any

explanation that relied upon any prolonged lack of knowledge about such aggregate variables as the supply of money.

### **Losing the Training Wheels by Embracing Non-equilibrium Theory**

Traditional Austrian macro starts from solid intuitions about dispersed knowledge and the generation of generally coherent structures of production within a market economy. Within the context of economic theory in the early 20<sup>th</sup> century, these ideas were on the cutting edge of economic theory at the time, as evidenced by Hayek's being recruited to the London School of Economics. While much has been made of the Keynes-Hayek dispute that ended with the domination of Keynesian macro over traditional Austrian macro, we doubt that this domination has much to do with the vocal ideological overtones that have been spread over this dispute in recent years.

To the contrary, we think that traditional Austrian macro lost traction because there was never developed a sufficient supply of complementary pieces of intellectual capital that would render the Austrian scheme sensible and competitive in the continually changing world of economic scholarship. For one thing, the Walrasian notion of general equilibrium had given way to new articulations of general equilibrium, mostly developed in Vienna. While Keynesian-style macro and Viennese general equilibrium did not have many points of direct contact, there were some crossovers and, moreover, both schemes of thought operated under a presumption that the contours of an entire economy could be apprehended with sufficient clarity to use policy to guide the ship of state. While Lucas (1975) originally thought his islands model provided a basis for denying that the ship of state could be subject to easy and accurate guidance, he soon

reversed himself and fell in line with presumptions that economies are always in equilibrium states and are lurching from one such state to another in response to exogenous shocks.

It seems clear that the presumption that all economic observations pertain to states of equilibrium destroys any coherence for the central Austrian intuitions out of which traditional Austrian macro emerged. Those intuitions centered on the recognition that societies were complex entities of interacting agents which no master puppeteer controlled or directed, and so instead comprised a self-ordered system with guidance provided by a general adherence to ethical principles and legal rules and processes. Hayek's (1937, 1945) emphasis on the use of distributed knowledge unfortunately came after his articulation of macro theory. We are quite confident in asserting that had Hayek's recognition of distributed and incomplete knowledge preceded his treatment of macro theory, his macro theory would have taken on a different character and we would not now be writing about New Austrian macro theory.

One thing we would note, though, is that non-equilibrium theory has nothing to do with disequilibrium theory. A disequilibrium theory draws meaning only in conjunction with equilibrium theory. In contrast, a non-equilibrium theory simply holds that equilibrium is not a useful systemic-level construct for economic theory. Sure, societies are generally orderly, though never fully. Moreover, there can be much stability among aggregate variables in conjunction with much turbulence among the individual variables that constitute those aggregates. Mitchel Resnick (1994) coined the term "centralized mindset" to characterize patterns of thought that attribute any observation of orderliness to some ordering agent, even though the actual order may be an emergent quality of

interactions among the relevant entities. To describe orderliness as denoting a state of societal equilibrium is to embrace the centralized mindset, which is surely contrary to all Austrian institutions going back to Carl Menger (1871).

### **Non-equilibrium, Order, and Stylized Systemic Facts**

Macro theorists often work with stylized facts, and seek to explain those facts. Among the facts with which macro theorists seek to explain within the DSGE model are the procyclical behavior of real output and real wages, the acyclical behavior of the real interest rate, and the countercyclical behavior of unemployment. A skeptic might wonder whether what is being explained is some feature of reality or is some creation of the national income accounts that might be but a shadow of that reality (Morgenstern 1962). Whatever that skeptic might conclude, the central point to notice about those types of stylized facts is that they attain significance when reflected against the underlying presupposition that systemic equilibrium is the normal state of affairs, with this placidity disrupted by exogenous shocks. To be sure, standard macro exhibits curiosity as to whether the observed time series reveal a stable trend buffeted by shocks and cycles or a continual parade of variations in a real rate of growth.

Left out of such examinations are two overwhelming facts that are more than stylized. One fact is that societies work: people get fed, clothed, and housed, and populations grow. This is an observable fact. The second fact is that there is continual volatility within societies. Some businesses prosper, others fail. Quarrels among people invariably erupt. Social life has a good deal of roughness and volatility, and by no stretch of the imagination is it placid. Change comes not as an exogenous shock but as

an emanation from inside a society. That such emanations occur continually, moreover, mean that plans are never fully coordinated within a society, so equilibrium can only be a fiction.

Economies have a generally coordinated quality, in that the quantity of grain converted into flour generally matches the amount of bread that bakers want to bake and consumers want to buy. Another such fact is that such coordination is never complete. The production of grain is subject to variability in the weather. Bread that is baked might not reach the store where it was scheduled to be sold because the truck carrying the bread was destroyed in a collision with a train. Alternatively, bakers or truck drivers might be unionized and go on strike. Furthermore, a good number of consumers might think they should reduce their consumption of bread and other products made from grain. Things like this happen continually, which means that fluidity and change are likewise a stylized fact of economic life.

Economic life is generally orderly, but the associated orderliness is not that of equilibrium theory. The distinction between equilibrium and orderliness can be conveyed by two distinct social configurations with which all readers are familiar. One is a parade, the other is a moving crowd of pedestrian rushing to different destinations. The parade is an equilibrium configuration, which means that it can be reduced to a point on a map and its motion traced. The direction and speed of march is controlled by a parade marshal. The crowd of pedestrians leaving a stadium after an event is likewise an orderly social configuration. People know how to get from their place in the stadium to their desired destination. Unlike the members of a parade, the members of the pedestrian crowd will not know the exact path of exit they will take until they start their



movement from the stadium. They may have to do such things as walking around a crowd of slow moving pedestrians in front of them or having to run to catch a bus that is just now pulling into the curb a short distance in front of them.

The pedestrian crowd is clearly a different species of societal configuration than is the parade. Both configurations are orderly, but the principles that govern that orderliness differ between the configurations. The orderliness of the parade is governed by the musical and marching talents of the members of the parade, as well as of the directional and supervisory talents of the parade marshal. These features have nothing to do with the orderliness of the pedestrian crowd. The orderliness of the crowd depends on such things as the ability of people to read minds as it were, by anticipating other people's speed and direction of movement so as to avoid collisions. It also depends on the degree to which ethical principles regarding courteous action inside crowds have been internalized among the pedestrians.

In other words, the pedestrian crowd is a self-organized social configuration; it is an order of independently acting pedestrians. In contrast, the parade is an organization under the direction of a parade marshal. When we come to macro theory, standard macro theory implicitly operates with the image of a national economy as an economizing entity. What enables construction of that image is the presumption of systemic equilibrium, for this presumption reduces the entire set of participants to a point on a map, much as the population of some territory can be reduced to a center of mass. In sharp contrast, traditional Austrian macro theory sought to theorize in terms of a self-ordered social system. While equilibrium theory was the only game in town a century ago when Austrian macro got underway, that is no longer the case. Tools of

thinking now exist that enable theorists to think about systems of interacting agents without imposing some presumption of systemic equilibrium on them.

### **New Austrian Macro Theory as Creative Systems Theory**

In conceptualizing the nature of economies, and devising a view of what macroeconomics involves, we draw on the theory of complex systems. There are many different definitions of complexity, none of which command universal ascent (Horgan 1997; Rosser 2015). While acknowledging that the following list of features will not accord perfectly with everyone's idea of the hallmarks of a complex system, we nevertheless believe that it captures many of the key aspects of such systems:

- First, a complex system—more specifically, one that displays organised complexity—is composed of a set of elements or parts that are related to each other in particular ways. A system is, in Hayek's words, “a coherent structure of causally connected ... parts” (Hayek n.d.: 4; also see Page 2011: 24 and Veetil and Wagner 2015).<sup>2</sup>
- Second, the interactions between the elements, and therefore the system's structure, can be described in terms of sets of rules. The rules in question, which can be very simple, require that the parts or elements interact with each other in certain ways (Hayek [1967] 2014: 285; also see Page 2011: 25; Colander and Kupers 2014: 136-37).

---

<sup>2</sup> Hayek acquires the notion of a 'system' from Ludwig von Bertalanffy. For more on Bertalanffy's influence on Hayek, see Lewis (2016a, 2016b).

- Third, the system that is formed when the elements relate to, and interact with, one another in the appropriate fashion has properties that are qualitatively distinct from those possessed by the parts taken in isolation. The existence of such emergent properties, as they are known, means that complex “wholes” are “‘more’ than ‘merely the sum’ of the parts” (Hayek [1964] 2014: 262; Hayek: 1952a: 147; also see also Page 2011: 25-26; Colander and Kupers 2014: 118, 129-30).
- Fourth, these emergent properties are often—though not always—the outcome of a process of self-organisation, in the sense that they arise as a consequence of the rule-guided responses of the individual agent-parts to their immediate environment (rather than from directions issued by a central controller possessing an over-arching, synoptic view of the entire system) (Hayek [1967] 2014: 285; also see Harper and Lewis 2012; Colander and Kupers 2014: 48-53, 116-18).
- Fifth, complex systems are hierarchical, with systems of one kind constituting the building blocks out of which other kinds of system, possessing their own distinctive structure and emergent properties, are formed. For instance, the individual people who are the parts from which social systems are made are themselves complex systems, formed out of structured arrangements of chemical and biological parts (Hayek 1952b). “Societies,” Hayek ([1967] 2014: 288) notes, “differ from simply complex structures by the fact that their elements are themselves complex structures.” On this view, the world consists of a nested set of complex systems, with the ‘lower’ or micro-level systems existing within the

context of 'higher' or macro-level systems in a hierarchy of levels of complexity (Page 2011: 26; Colander and Kupers 2014: 50, 137).

- Sixth, because the existence of emergent properties depends not only on the presence of particular agents but also on their standing in certain relations to one another, such properties are ontologically and causally irreducible to the properties of the agents of which they are composed. Therefore, attempts to explain the properties and behaviour of complex systems by reducing them to the properties of their isolated constituent parts are flawed. A satisfactory analysis requires knowledge not only of the isolated parts but also of the relations in which those parts stand to each other and, therefore, of rules governing how the parts relate and interact with one another (Miller and Page 2007: 41-45, 50-51; Jepperson and Meyer 2011: 68-69; Lawson 2012: 352; Colander and Kupers 2014: 47, 50-53; Lewis 2016c).
- Seventh, emergent properties are often novel in the sense that they could not have been predicted *ex ante*, given people's knowledge of the properties of the component parts (Hayek [1964] 2014: 261-62; also see Anderson 1972). Their occurrence is, therefore, a genuine surprise in the sense that it lies outside the confines of what people had hitherto imagined might happen (Runde 2009 498-501; Harper and Lewis 2012: 329-32; Colander and Kupers 2014: 130). On this view, novelty is generated not only through exogenous shocks but also endogenously, when elements combine so as to give rise to emergent properties. The existence of emergent novelty is important because it implies that people cannot specify in advance all the possible states of the world that might shape

the outcomes to which their actions give rise. People must therefore deal with radical uncertainty in the Keynesian or Knightian sense of being unable to assign sharp numerical probabilities to the possible consequences of their actions. As a result, they cannot act in the expected-utility maximizing fashion postulated by rational decision theory.<sup>3</sup>

- Eighth, the emergent outcomes displayed by complex systems are best understood, not as a static equilibrium, but rather in terms of some alternative, more dynamic conception of ‘order’—such as the notion of a ‘basin of attraction’—whereby an overall, higher-level pattern is sustained by the oft-changing, but still structured, (inter)actions of its lower-level constituent parts (Page 2011: 27; Colander and Kupers 2014: 49, 92, 118-19, 136-38). Hayek explicitly abandoned the notion of equilibrium in the 1960s favour of the notion of

---

<sup>3</sup> Put more formally, the problem to which creative decision-making gives rise is that the state space—that is, the set of states of the world that determine the consequences to which a decision-maker’s actions lead—is incomplete. The novelty introduced into the economic system by the existence of emergent properties violates one of the key presuppositions of the neoclassical theory of rational choice under uncertainty, namely the assumption that people possess from the outset a comprehensive list of all the various possible states of the world that are relevant to their decisions. This assumption, which is variously known as the ‘small-world’ or ‘grand state space’ assumption, rules out the possibility of new, previously unimagined events. In doing so, it helps to ensure that the rational actor faces a well-defined decision-problem in which sharp, numerical probabilities can be attached to the consequences of the courses of action open to them (Savage: 1954; Gilboa *et al.* 2012). However, the existence of novel emergent properties makes it impossible for people to specify in advance all the possible states of the world in which they might be called upon to act, and which might shape the consequences of their actions. Emergence is thus one of the reasons why ‘in many decision problems under uncertainty states of the world are neither naturally given nor simply formulated ... often even a comprehensive list of all possible outcomes is not readily available or easily imagined’ (Gilboa and Schmeidler 1995: 606). And where the consequences of people’s decisions are determined by events that do not even register as possibilities for the decision-makers in question, then the evidential basis for the calculation of meaningful probabilities will be lacking (Shackle 1979: 52-60, 80-84). About such matters, as Keynes famously put it, “there is no scientific basis on which to form any calculable probability. We simply do not know” (1937: 214).

‘order’, on the grounds that “an equilibrium presupposes that the facts have already been discovered and competition has therefore ceased” ([1968] 1978: 184). In its place, Hayek proposes the notion of (social) order, understood as “a state of affairs in which a multiplicity of elements of various kinds are so related to each other that we may learn from our acquaintance with some spatial or temporal part of the whole to form correct expectations concerning the rest, or at least expectations which have a good chance of proving correct” (Hayek 1973: 36). The advantage the notion of ‘order’ gives, Hayek contends, is that “we can meaningfully speak of an order being approved to various degrees, and that order can be preserved throughout a process of change” ([1968] 1978: 184; also see Caldwell 2004: 226-27 and Lewis and Lewin 2015: 10-11).

- Ninth, the systems obtaining at each level are adaptive in the sense that they adjust to the broader environment in which they are situated via an evolutionary process involving variation, selection, and (differential rates of) reproduction (pp. 50-53, 138 (Hayek [1967] 2014: 282-87, 1979: 153-65; also see Page 2011: 25; Colander and Kupers 2014: 136-37, 143, 181-91).

Consider, for example, Hayek’s account of the market economy. For Hayek, a market system arises when the relations between people are governed by a set of rules that includes both the formal legal rules of contract, property and tort law, and also informal moral rules of honesty and promise-keeping. Those rules define various positions (e.g. buyers and sellers, creditors and debtors, employers and employees,) and set out the rights their occupants enjoy and the obligations they bear. The rules

specify in broad terms how the occupants of those positions must relate to one another (e.g. debt contracts specify the rights and responsibilities of borrowers and lenders, detailing for example the interest rate and repayment schedule for the loan in question). In this way, the rules in question define the relations between those positions, specifying in broad terms how people should relate to one another in order to form a working market system (Hayek 1976: 107-32; also see Lewis 2014, 2015; Wagner 2012a: 13-16, 27-28, 31-32).<sup>4</sup>

Constituted in this way, the system exhibits properties that differ from those of its constituent parts. Prominent amongst these emergent properties is the capacity to coordinate people's plans, even when they are formed independently by individuals in the light of their own particular ('local') knowledge. What Hayek shows is that, once people's interactions are structured by an appropriate set of rules, a configuration of relative prices is generated that—when coupled with the background information provided by social rules—enables people to adjust their plans so that they dovetail with each other and therefore have a decent chance of coming to fruition (that is, for social order to obtain). The coordinative power in question, which Hayek ([1967] 2014: 280) refers to as “the overall order of actions”, is an emergent property because it is possessed only by a particular whole—namely the free market system that is constituted by a group of people whose interactions are structured by a set of rules that includes the formal rules of contract, tort and property law, along with informal norms of trust and promise-keeping—and not by those individuals taken in isolation. It is ‘more than the totality of regularities observable in the actions of the individuals and cannot be

---

<sup>4</sup> For an account of the nature of money, consistent with the system-theoretic position outlined here, see Lawson (2016).

reduced to them ... It is more than the mere sum of its parts but presupposes also that those elements are related to each other in a particular manner' (Hayek [1967] 2014: 282; also see Lewis 2012, 2015; Wagner 2012a: 14, 20, 62, 77, 95-116).

The ontological irreducibility of this emergent property implies that it cannot be reduced to, or replaced without loss of cognitive content by descriptions of, (the properties of) a single (representative) individual and thereby eliminated from causal explanations of phenomena of interest (Hoover 2015: 690-92, 695-96, 703). That is to say, an eliminative reduction of the emergent entity—whereby references to it are entirely replaced by, or reduced to, statements about the properties of its isolated component parts—is not possible. The reason is that any causal explanation that rests upon the exercise of the emergent, system-level powers of some emergent entity, such as an appropriately formed market system, depends not only upon the properties of that system's parts but also upon the way in which they are related to each other; the emergent properties arise, and have the causal effects they do, only because of how their individual parts are organised. Causal explanations that invoke such powers therefore depend critically upon more than the properties of the isolated individual elements, namely the relations in which those elements must stand to one another in order for the emergent causal power in question to obtain. And it is because of the need to refer to the requisite organizing structures and relations that the possibility of reduction is foreclosed (Elder-Vass 2010: 24-25, 54-58; Lawson 2012: 350-53).

On this view, the key contribution of (macro-)social theory is to investigate how, if people's interactions are characterized by a particular set of social relations, they will unintentionally produce some social phenomenon of interest. In Hayek's words: "It is the



so-called wholes, the groups of elements which are structurally connected, which we have learned to single out from the totality of observed phenomena ... [and which] are the condition for the achievement of many of the things at which we as individuals aim, the environment which makes it possible even to conceive of our individual desires and which gives us the power to achieve them” (Hayek [1942] 2010: 102-03, [1944] 144.) In contrast to the orthodox micro-foundations project, which seeks to reduce macro-economic phenomena to the behaviour of isolated, atomistic economic agents, the approach advocated here would focus on attempting to identify the sets of social relations—and the systems of social rules that give rise to them—that underpin economic phenomena of interest, as Hayek does in his efforts to explain the possibility of social order (Wagner 2012a: 58, 61, 77; Lewis 2016c). So conceived, macro-social theory might be thought of as attempting to pose, and to answer, questions of the form, ‘What must the overall institutional structure of the economy be like in order for microeconomic phenomena of interest to be possible?’ Such an approach is seeking to uncover what one might call the ‘macro-foundations of microeconomics’, in the sense of attempting to identify the systems of social rules that underpin microeconomic phenomena of interest (as well as how people’s actions lead either to the reproduction or transformation of those structures) (Smithin 2004; Wagner 2012a: 51, 137-59, 2012b: 435).

On this view, the central focus of macro-theory is the institutions in virtue of which the things conventionally regarded as macroeconomic phenomena exist. In emphasizing the importance of investigating whether the institutional framework or system of rules, within which economic activity takes place is such that people’s

(inter)actions generate as emergent properties the information and incentives required for people to coordinate their plans, we believe the new Austrian macroeconomics is consistent with, and a fruitful development of, Buchanan's ([1964] 1999) account of the central concern of economics as being the examination of the institutions that can facilitate voluntary, mutually advantageous exchange and thereby support the market order or catallaxy. Central to such an approach would be the examination of the comparative properties of different configurations of institutions, or rule systems, with particular regard to their capacity to sustain the emergent coordinative powers in question (Wagner 2016; Lewis 2013).

In considering the subject-matter of new Austrian macroeconomics, as understood here, the emphasis on the structure of production mentioned above suggests that special attention ought to be devoted to those factors governing the orderly allocation of resources over time (that is, between present and future consumption). In that case, a key question for macroeconomics becomes which set of institutions, or system of rules, will generate the information and incentives required to coordinate the plans of savers and investors. And, in keeping with the comparative institutional perspective outlined in the previous paragraph, significant issues here concern the relative capacities of different systems of rules for governing the supply of money and credit to generate the incentives and information required to ensure that the plans of banks concerning how much money and credit to supply are well coordinated with the demand arising from consumers and businesses. Put slightly differently, the goal of macroeconomics thus conceived is to identify the constitutional provisions required to facilitate a well-functioning monetary order, in which people have reliable

expectations about the future value of money and in which, as a result, (changes in) money prices provide reflect (changes in) the relative scarcities of resources with sufficient accuracy for economic calculation and purposeful activity to be possible. At issue here will be questions such as whether there is a need for a distinctive *monetary* constitution, beyond the general constitutional protections provided by the rules of contract, property and tort law, in order to ensure the emergence of the requisite monetary regime, and the merits of free banking.<sup>5</sup> In this way, the existence of emergent properties can justify a distinctive sub-discipline of macroeconomics. Whereas the dominant approach to macroeconomics over the past three to four decades has emphasised the need to provide micro-foundations for macroeconomics—that is, to show how relations amongst macroeconomic variables can ultimately be reduced to, and explained solely in terms of, the behaviour of individual economic actors—the possibility of emergence suggests there is a distinctive subject-matter for macroeconomics, centring on the tasks of identifying and illuminating the social relations, and associated systems of rules, that must be in place for social order—perhaps most notably, given our emphasis on the structure of production described above, the orderly allocation of resources between present and future consumption—be possible.

In pursuing the objective of identifying the macro-institutional foundations of microeconomics, we do not of course mean to suggest that those social rules should be

---

<sup>5</sup> Recent examples of the kind of work we have in mind, in addition to the essays in this special issue, are Buchanan (2010), Horwitz (2011), Smith *et al.* (2011), Koppl (2014), Salter (2014), Wagner (2014), Boettke and Smith (2016), and Paniagua (2016). Antecedents include Buchanan [1962] 1999, Buchanan and R. Wagner ([1977] 2000), Hayek ([1978] 1999), and Selgin and White (1994).

reified, their (continued) existence simply being assumed or taken for granted. On the contrary, as Hayek for example makes clear, it is necessary to couple the kind of explanatory endeavour described above, which involves the (static) analysis of how when people's (inter)actions are structured by a given system of rules they produce an emergent outcome of interest, with a more dynamic account of how the relevant system of rules comes about in the first place (Hayek [1967] 2014: 284-87). The specific account offered by Hayek is, of course, one in which the relevant systems of rules arise, are maintained, or cease to exist through a process of cultural evolution in which systems of rules are selected according to how effectively they coordinative the plans of the members of the groups who subscribe to them (Gaus 2006; Lewis 2015). However, the general picture of the relationship between social structure and human agency that underwrites our account of how the systems of rules that facilitate coordinated action does not hinge on the merits of Hayek's specific, and controversial account, which is mentioned here principally for illustrative purposes. Whatever the merit and demerits of that particular theory, the broad account of the structure-agency relationship underpinning the new Austrian macroeconomics suggests that they are mutually dependent or recursively related, so that each is both a necessary condition for, and also a consequence of, the other: pre-existing social rules facilitate intentional human agency, as when entrepreneurs rely on the legal system in order to draw up business contracts; while the continued existence of those rules depends on people continuing to make use of them when they act.

On this view, just as there is a need for a macro-foundations of microeconomics, involving the examination of how certain sets of social rules facilitate coordinated

activity, so too is it equally necessary to study the micro-foundations of macroeconomics, rightly understood as involving the examination of how people's actions, structured by the relevant system of rules, lead to the reproduction or transformation of the rules in question.<sup>6</sup> Just as there is no question of macro-level variables being explained simply by reducing them to the properties of isolated agents, and in the most extreme case to the choices of a single representative agent,<sup>7</sup> so too does new Austrian macroeconomics eschew efforts to explain macro-level phenomena simply by reference to other macro-level facts.<sup>8</sup> New Austrian macro theory would work within an emergent motif, where what standard macro theories label as data are viewed rather as emergent resultants of the structured interaction between micro-level agents.

This recognition entails a scheme of thought where there is two-way interaction between micro and macro levels of theorizing, encapsulating both the search for micro-foundations, correctly interpreted as requiring an understanding of how macro-phenomena arise out of human (inter)action, and also an effort to conceptualize how those emergent macro-structures, by organizing how people interact, in turn shape

---

<sup>6</sup> One can put this point slightly differently, in terms of different kinds of analysis of emergent properties. One might give a static or synchronic account of how at a given point in time the interaction of a particular set of parts, organized so that they stand in certain relations to one another, gives rise to the existence of a particular emergent property (that is to say, one might give an account of how the parts, suitably organized, constitute a causal mechanism whose operation generates the emergent property in question). However, because the presence both of the parts and also of the relations that organize them into the relevant mechanism are contingent matters, and so cannot be taken for granted, a fuller analysis of an emergent property also requires a dynamic or diachronic account of how the requisite configuration of parts and relations comes about (Lewis 2015).

<sup>7</sup> For more on the pathologies of the representative agent model, see Kirman (1992, 2010).

<sup>8</sup> Latour (2005) explores the shortcomings of approaches that seek to explain macro-level social facts simply in terms of other, macro-level facts, without considering the interaction between micro-level elements that constitutes the underlying causal mechanism linking macro-level phenomena.

people's actions. Combining these two lines of thought leads to what might be described as a transformational model of social activity, according to which the relationship between structure and agency is one of non-reductionist co-development: both social structure and human agency possess their own *sui generis*, emergent causal powers, so although each depends on the other neither has ontological or analytical priority (Lewis 2008: 844-51; Lewis and Lewin 2015: 10-12; Wagner 2012a: 1-2, 2012b; Veetil and Wagner 2015).

### **Concluding Remarks**

To set forth a manifesto for a research program has been no part of our intension. Our intention has been rather to uncover some analytical challenges and opportunities that we think hold potential for bringing Austrian intuitions and conceptions once again into the foreground of thinking about the systemic properties of different schemes of economic interaction. There is much work to be done by numerous people with varied talents. The papers presented below by these astute and energetic students of civilization (Dekker 2016) have flashed some light into the vast uncharted territory that must be explored truly to understand the moral and institutional facets of self-governing societies.

## References

Anderson, P. 'More is Different.' *Science*, 177 (August 2): 393-96.

Boettke, P. and D. Smith (2016). 'Evolving Views on Monetary Policy in the Thought of Hayek, Friedman, and Buchanan.' *Review of Austrian Economics*.  
Online first. Doi: 10.1007/s11138-015-0334-8

Buchanan, J. ([1962] 1999). 'Predictability: The Criterion of Monetary Constitutions.' In Buchanan (1999).

Buchanan, J. ([1964] 1999). 'What Should Economists Do?' In Buchanan (1999).

Buchanan, J. (1999). *The Collected Works of James M. Buchanan, Volume 1: The Logical Foundations of Constitutional Liberty*. Edited by G. Brennan, H. Kliemt and R. Tollison. Indianapolis: Liberty Fund.

Buchanan, J. (2000). 'The Constitutionalization of Money.' *Cato Journal*, 30: 251-58.

Buchanan, J. and R. Wagner ([1977] 2000). *The Collected Works of James M. Buchanan, Volume 8: Democracy in Deficit*. Edited by G. Brennan, H. Kliemt and R. Tollison. Indianapolis: Liberty Fund.

Caldwell, B. (2004). *Hayek's Challenge: An Intellectual Biography of F.A. Hayek*.

Chicago and London: The University of Chicago Press.

Colander, D. and R. Kupers (2014). *Complexity and the Art of Public Policy*.

Princeton and Oxford: Princeton University Press.

Dekker, E. (2016). *The Viennese Students of Civilization: The Meaning and Context of Austrian Economics Reconsidered*. Cambridge; Cambridge University Press.

Elder-Vass, D. (2010). *The Causal Power of Social Structures: Emergence, Structure and Agency*. Cambridge: Cambridge University Press.

Fleetwood, S. ([1996] 2015). 'Order without Equilibrium: A Critical Realist Interpretation of Hayek's Notion of Spontaneous Order.' *Cambridge Journal of Economics*, 20: 729-47. Reprinted in S. Pratten (ed. (2015).

Garrison, R. W. 2001. *Time and Money: The Macroeconomics of Capital Structure*. London: Routledge.

Gaus, J. (2006). 'Hayek on the Evolution of Society and Mind.' In E. Feser (ed.), *The Cambridge Companion to Hayek*. Cambridge: Cambridge University Press.



Gilboa, I. and D. Schmeidler (1995). 'Case-Based Decision Theory.' *Quarterly Journal of Economics*, 110: 605-39.

Gilboa, I., A. Postlewaite and D. Schmeidler (2012). 'Rationality of Belief or: Why Savage's Axioms are neither Necessary nor Sufficient for Rationality.' *Synthese*, 187: 11-31.

Graça Moura, M. da ([2002] 2015). 'Metatheory as the Key to Understanding: Schumpeter after Shionoya.' *Cambridge Journal of Economics*, 26: 805-21. Reprinted in S. Pratten (ed., 2015).

Graça Moura, M. da (2004). 'A Note on Critical Realism, Scientific Exegesis, and Schumpeter.' In Lewis (ed.) (2004).

Harper, D. and P. Lewis (2012). 'New Perspectives on Emergence in Economics.' *Journal of Economic Behavior and Organization*, 82: 329-37.

Hayek, F. A. 1932. *Monetary Theory and the Trade Cycle*. New York: Harcourt Brace.

Hayek, F. A. 1935. *Prices and Production*, 2<sup>nd</sup> ed. London: Routledge and Kegan Paul.

Hayek, F. A. 1937. "Economics and knowledge." *Economica* 4: 33-54.

Hayek, F.A. 1945. "The use of knowledge in society." *American Economic Review* 35: 519-30.

Hayek, F. ([1952a] 2010). 'Scientism and the Study of Society.' In F.A. Hayek, *The Collected Works of F.A. Hayek, Volume 13: Studies on the Abuse & Decline of Reason*. Edited by B. Caldwell. Chicago: The University of Chicago Press.

Hayek, F.A. (1952b). *The Sensory Order: An Inquiry into the Foundations of Theoretical Psychology*. London and Henley: Routledge & Kegan Paul.

Hayek, F.A. ([1964] 2014). 'The Theory of Complex Phenomena.' In F.A. Hayek (2014).

Hayek, F.A. ([1967a] 2014). 'Notes on the Evolution of Systems of Rules of Conduct.' In F.A. Hayek (2014).

Hayek, F.A. ([1968] 2014). 'Competition as a Discovery Procedure.' In Hayek (2014).

Hayek, F.A. (1973). *Law, Legislation and Liberty: A New Statement of the Liberal Principles of Justice and Political Economy. Volume I: Rules and Order*. London and New York: Routledge.

Hayek, F.A. (1976). *Law, Legislation and Liberty: A New Statement of the Liberal Principles of Justice and Political Economy. Volume II: The Mirage of Social Justice.* London and New York: Routledge.

Hayek, F. ([1978] 1999). 'The Denationalization of Money: An Analysis of the Theory and Practice of Concurrent Currencies.' In F. A. Hayek, *The Collected Works of F.A. Hayek, Volume 6: Good Money, Part II: The Standard.* Edited by S. Kresge. Chicago: The University of Chicago Press.

Hayek, F.A. (1979). *Law, Legislation and Liberty: A New Statement of the Liberal Principles of Justice and Political Economy. Volume III: The Political Order of a Free People.* London and New York: Routledge.

Hayek, F.A. (2014). *The Collected Works of F.A. Hayek, Volume 15: The Market and other Orders.* Edited by B. Caldwell. Chicago: The University of Chicago Press.

Hayek, F.A. (n.d.). 'Within Systems and About Systems: A Statement of Some Problems of a Theory of Communication.' Typescript. Hoover Institution, Hayek Archives, box 104, folder 22.

Hoover, K. (2015). "Reductionism in Economics: Intentionality and Eschatological Justification in the Microfoundations of Macroeconomics.' *Philosophy of Science*, 82: 689-711.

Horgan, J. (1997). *The End of Science: Facing the Limits of Knowledge in the Twilight of the Scientific Age*. New York: Broadway Books.

Horwitz, S. 2000. *Microfoundations and Macroeconomics: An Austrian Perspective*. London: Routledge.

Horwitz, S. (2011). 'Do we need a Distinct Monetary Constitution?' *Journal of Economic Behavior and Organization*, 80: 331-38.

Jepperson, R. and J. Meyer. (2011). 'Multiple Levels of Analysis and the Limitations of Methodological Individualism.' *Sociological Theory*, 29: 54-73.

Keynes, J. M. (1937). 'The General Theory of Employment.' *Quarterly Journal of Economics*, 51: 209-223.

Kirman, A. (1992). 'Whom or What does the Representative Agent Represent?' *Journal of Economic Perspectives*, 6: 117-36.

Kirman, A. (2010). 'The Economics Crisis is a Crisis for Economic Theory.' *CESifo Economic Studies*, 56: 498-535.).

Koppl, R. (2014). *From Crisis to Confidence: Macroeconomics after the Crash*. London: The Institute for Economic Affairs.

Latour, B. 2005. *Reassembling the Social: An Introduction to Actor-Network Theory*. Oxford: Oxford University Press.

Lawson, T. (2012). 'Ontology and the Study of Social Reality: Emergence, Organisation, Community, Power, Social Relations, Corporations, Artefacts and Money.' *Cambridge Journal of Economics*, 36: 345-85.

Lawson, T. (2016). 'Social Positioning and the Nature of Money.' *Cambridge Journal of Economics*. Online first. doi: 10.1093/cje/bew006.

Lewis, P. (ed.) (2004). *Transforming Economics: Perspectives on the Critical Realist Project*. London and New York: Routledge.

Lewis, P. (2008). 'Solving the 'Lachmann Problem': Orientation, Individualism and the Causal Explanation of Socio-Economic Order.' *American Journal of Economics and Sociology*, 67: 827-57.

Lewis, P. (2012). 'Emergent Properties in the Work of Friedrich Hayek.' *Journal of Economic Behavior and Organisation*, 82: 368-78.

Lewis, P. (2013). 'On Hayek, Social Theory and the Contrastive Explanation of Social Order.' *Critical Review*, 25: 1-23.

Lewis, P.A. (2015). 'Notions of Order and Process in Hayek: The Significance of Emergence.' *Cambridge Journal of Economics*, 39: 1167-90.

Lewis, P.A. (2016a). 'The Emergence of "Emergence" in the Work of F. A. Hayek.' *History of Political Economy*, 48: 111-50.

Lewis, P.A. (2016b). 'Systems, Levels of Organisation and Structural Properties: The Influence of Ludwig von Bertalanffy on the Development of the Work of F.A. Hayek.' Forthcoming in *Research in the History of Economic Thought and Methodology*.

Lewis, P.A. (2016c). "Ontology and the History of Economic Thought: The Case of Anti-Reductionism in the Work of Friedrich Hayek.' Unpublished working paper, Department of Political Economy, King's College London.

Lewis, P. and P. Lewin (2015). 'Orders, Orders, Everywhere ... On Hayek's *The Market and Other Orders*.' *Cosmos and Taxis*, 2 (2): 1-17.

Lucas, R. E. Jr. 1975. "An Equilibrium Model of Business Cycles." *Journal of Political Economy* 83: 1113-44.

Menger, C. 1871[1981]. *Principles of Economics*. New York: New York University Press.

Miller, J. and S. Page. 2007. *Complex Adaptive Systems*. Princeton and Oxford: Princeton University Press.

Morgenstern, O. 1962. *The Accuracy of Economic Observations*, 2<sup>nd</sup> ed. Princeton, NJ: Princeton University Press.

Page, S. (2011). *Diversity and Complexity*. Princeton and Oxford: Princeton University Press.

Paniagua, P. (2016). 'The Robust Political Economy of Central Banking and Free Banking.' *Review of Austrian Economics*, 29: 15-32.

Pratten, S. (ed.) (2015). *Social Ontology and Modern Economics*. London and New York: Routledge.

Resnick, M. 1994. *Turtles, Termites, and Traffic Jams: Explorations in Massively Parallel Microworlds*. Cambridge: MIT Press.

Rosser, J. B. (2015). 'Complexity and Austrian Economics.' In P. Boettke and C. Coyne (eds.), *The Oxford Handbook of Austrian Economics*. Oxford: Oxford University Press.

Runde, J. (2009). 'Dissecting the Black Swan.' *Critical Review*, 21: 491-505.

Salter, A. (2014). 'Is there a Self-Enforcing Monetary Constitution?' *Constitutional Political Economy*, 25: 280-33.

Savage, Leonard. 1954. *The Foundations of Statistics*. London: John Wiley & Sons.

Schumpeter, J. A. 1912 [1934]. *Theory of Economic Development*, 2<sup>nd</sup> ed. New York: Oxford University Press.

Selgin, G. and L. White (1994). 'How would the Invisible Hand Handle Money?' *Journal of Economic Literature*, 32: 1718-49.

Shackle, G. L. S. 1972. *Epistemics and Economics*. Cambridge: Cambridge University Press.

Shackle, G.L.S. (1979). *Imagination and the Nature of Choice*. Cambridge: Cambridge University Press.

Smith, A., R. Wagner and B. Yandle (2011). 'A Theory of Entangled Political Economy, with Application to TARP and NRA.' *Public Choice*, 148: 45-66.



Smithin, J. (2004). 'Macroeconomic Theory, (Critical) Realism and Capitalism.' In Lewis (ed., 2004).

Veetil, V. and R. Wagner (2015). 'Treating Macro Theory as Systems Theory: How Might it Matter?' *Advances in Austrian Economics*, 19: 119-43.

Wagner, R. (2012a). *Mind, Society, and Human Action: Time and Knowledge in a Theory of Social Economy*. London and New York: Routledge.

Wagner, R. (2012b). 'A Macro Economy as an Ecology of Plans.' *Journal of Economic Behavior and Organisation*, 82: 433-44.

Wagner, R. (2016). *Politics as a Peculiar Business: Insights from a Theory of Entangled Political Economy*. Cheltenham, UK: Edward Elgar.